

ARC TYPE F-19B ISOLATION AMPLIFIER



Aircraft Radio Corporation
BOONTON, NEW JERSEY

ARC TYPE F-19B

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ARC will pay the parts replacement charges for the first ninety days after installation of equipment to any ARC Authorized Service Agency. Request for payment must be accompanied by a properly executed Warranty Service Invoice, ARC Form No. 1888A.

ARC reserves the right to make changes in design or additions to or improvements in its equipment without obligation to make such changes or to install such additions or improvements in equipment theretofore manufactured.

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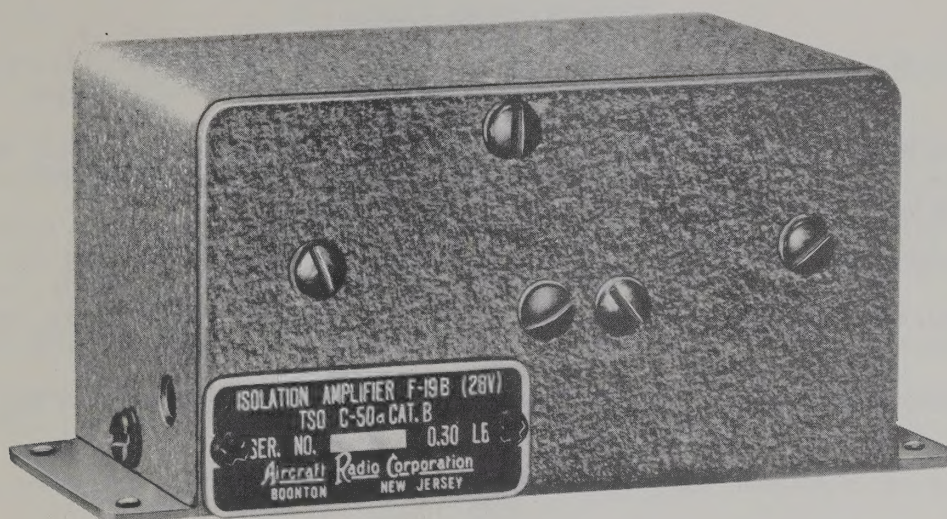


Figure 1. ARC Type F-19B Isolation Amplifier

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PURPOSE AND USE

The ARC Type F-19B Isolation Amplifier (Figure 1) is a transistorized, two-stage audio isolation amplifier. The F-19B combines as many as ten separate audio signals into a single channel without reducing the levels of the individual signals. The F-19B requires approximately 60 milliamperes at 28 volts dc during normal operation.

A typical application of the F-19B is as an isolation preamplifier in an aircraft audio system (see Figure 2). In this system, the pilot and copilot are provided with separate receiver output selector switches that control a common bank of audio load resistors, F-19B isolation amplifiers, 10-watt audio amplifier channels, and loudspeakers. The selector switches and F-19B amplifiers provide the pilot and copilot with individual selection of any combination of receiver output signals; the audio channels and loudspeakers provide them with individual loudspeaker outputs of the selected receiver signals.

SPECIFICATIONS

Input Impedance (each channel):	300 ohms
Isolation Between Channels:	Greater than 70 db
Frequency Response:	Less than 6 db down from 1000-cps reference level between 350 and 3000 cps
Distortion (350 cps):	8% maximum at rated output
Output Impedance:	600 ohms
Audio Output:	100 mw for 100 mw input (unity gain)
Power Required:	60 ma at 28 volts dc

Weight:	0.30 pound
Dimensions:	3-7/16 in. wide by 1-17/32 in. high by 1-7/8 in. deep
Certification:	FAA TSO C-50a, Category B

INSTALLATION

The F-19B may be installed in any convenient location near the receiver selector switches. The shielded audio leads between the output connectors of the receivers and the switches, and between the switches and the F-19B, should be kept as short as possible.

Install the F-19B as follows:

Step 1. Install receiver selector switches, F-19B power switch, audio load resistors, emergency headset jacks, and other system parts in convenient locations.

Step 2. Drill aircraft mounting surface, which should be clean, bare metal, for four No. 4 binding head machine screws, located as shown in Figure 3.

Step 3. Place unit in position, insert screws through F-19B mounting holes, and secure unit with nuts and lockwashers.

Step 4. Apply a receiver output signal to F-19B, and adjust level control of F-19B for desired headset volume or speaker-amplifier input signal level.

Note

If a volume control is used in aircraft's audio distribution system, set control to mid-position before adjusting F-19B level control.

MAINTENANCE

Schematic and wiring diagrams of the F-19B are shown in Figures 5 and 6, respectively. In case of faulty operation, remove the cover of the amplifier and inspect for loose connections and evidence of overheating. If the visual inspection does not disclose the trouble, use a d-c vacuum tube voltmeter to check for abnormal voltages at the points specified on the schematic diagram. Table I lists the test equipment required to maintain the F-19B; equivalent test equipment may be substituted.

TABLE I. TEST EQUIPMENT

Qty	Name	Designation	Characteristics
1	Audio Oscillator	Hewlett-Packard Model 200AB	-
1	Low-voltage Supply	-	28 volts, 5 amperes dc
1	Milliammeter	Weston Model 301	0 to 250 ma
1	Oscilloscope	Dumont Model 208	-
10	Resistor	-	330 ohms, 1 watt, carbon
1	Resistor	-	600 ohms, 1 watt, carbon
1	Rotary Switch	-	10 positions, nonshorting
10	Toggle Switch	-	Single pole, double throw
2	Vacuum Tube Voltmeter	Ballantine Model 300	-
1	Vacuum Tube Voltmeter	Hewlett-Packard Model 410B	-
1	Voltmeter	Weston Model 301	0 to 50 volts dc

Test the F-19B as follows:

Step 1. Interconnect F-19B and test equipment and set switches as shown in Figure 4. Apply power to test equipment and F-19B and allow a 15-minute warmup period.

Step 2. Set F-19B level control fully clockwise (maximum output).

Step 3. With no audio signal applied to F-19B, measure amplifier idle current. Current should not be greater than 60 ma.

Step 4. Adjust Hewlett-Packard Model 200AB to obtain a 1000-cps, 7.75-volt F-19B output. Measure audio oscillator output voltage. Voltage should be between 2.4 and 5.75 volts.

Step 5. Set F-19B level control fully counterclockwise. F-19B output should be reduced at least 19 db. Set level control fully clockwise.

Step 6. Adjust audio oscillator AMPLITUDE control to obtain a 2.45-volt F-19B output. Maintain a constant audio oscillator output voltage while varying output frequency between 350 and 3000 cps. F-19B output should not vary from 7.75 volts by more than ± 3 db.

Step 7. Adjust audio oscillator to obtain a 1000 cps, 7.75-volt, F-19B output.

Step 8. Observe F-19B output waveform on Dumont Model 208 Oscilloscope. Distortion should not be greater than 20%.

Note

If an oscilloscope is not available, an aural test should be used to determine if F-19B output contains objectionable distortion.

Step 9. Set switch S11 to position 1. Measure signal level at F-19B terminals 2 through 10. Signal level at these terminals should be at least 40 db below 7.75-volt input signal level.

Step 10. Using appropriate F-19B input terminals, repeat Step 9 for each position of switch S11.

Step 11. With switch S11 set to position 10, set switches S1 through S9 to ground position. F-19B output should not change.

PARTS LIST

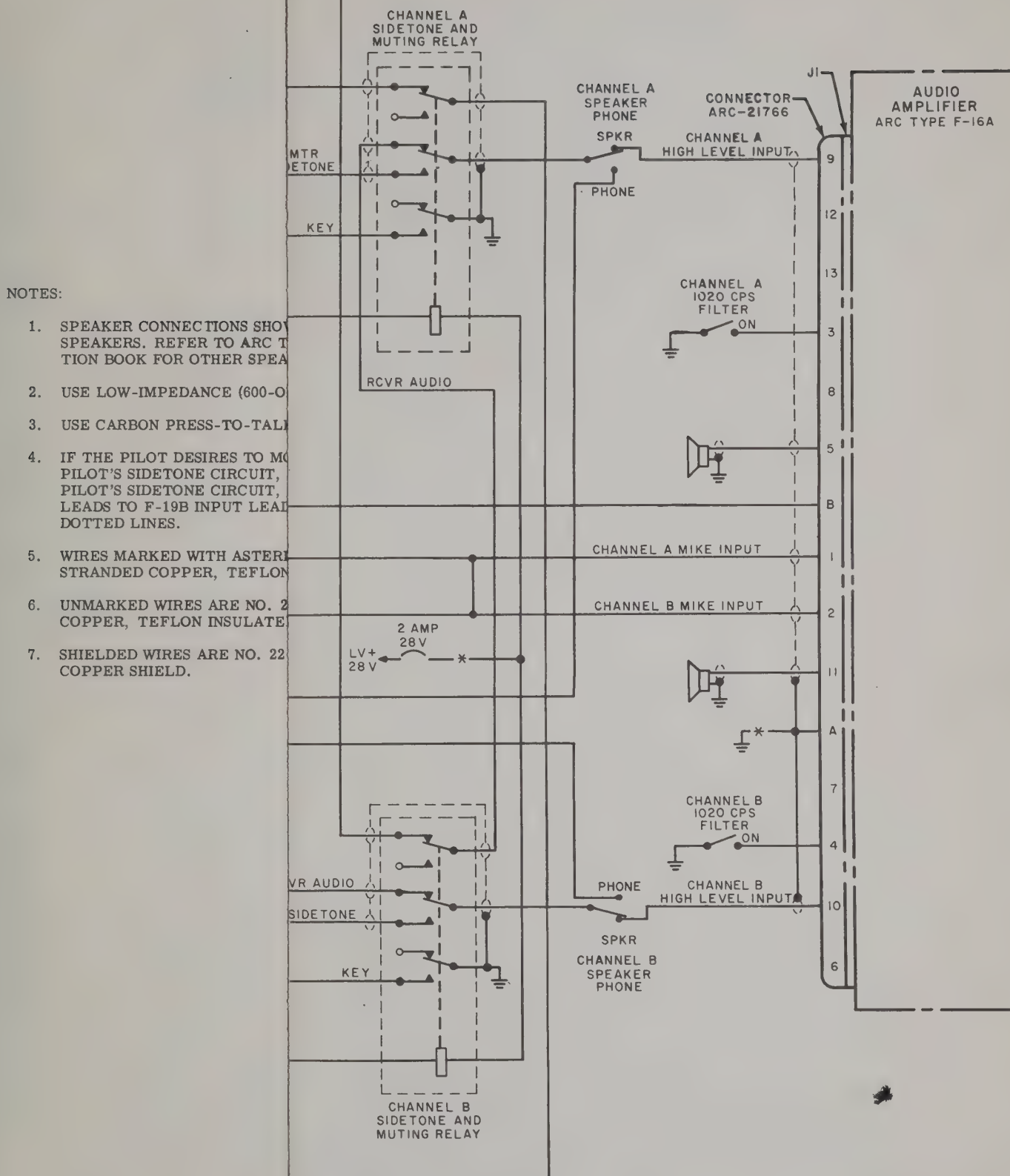
A list of replaceable parts for the F-19B is given in Table III. The manufacturers' codes listed in Table III are explained in Table II.

TABLE II. MANUFACTURERS' CODES

<u>Code</u>	<u>Name and Address</u>	<u>Code</u>	<u>Name and Address</u>
AB	Allen-Bradley Co. Milwaukee, Wisconsin	SPR	Sprague Electric Co. North Adams, Massachusetts
CMPB	Colin Campbell Co., Inc. Danbury, Connecticut	USC	U. S. Components, Inc. New York, New York
DABU	Dale Products, Inc. Columbus, Nebraska		

TABLE III. REPLACEABLE PARTS

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
C1	CAPACITOR, Fixed, electrolytic, 6.8 μ f ± 20 per cent, 35 vdcw	21485-9681	SPR 150D685X0035B2
C2	CAPACITOR, Fixed, electrolytic, 47 μ f ± 20 per cent, 20 vdcw	8914-0470	SPR 150D476X0020R2
C3	CAPACITOR, Fixed, electrolytic, 60 μ f ± 20 per cent, 6 vdcw	8918-0600	SPR 150D606X0006B2
C4	CAPACITOR, Fixed, same as C2		
C5	CAPACITOR, Fixed, electrolytic, 47 μ f ± 20 per cent, 50 vdcw	8924-0470	SPR 109D476X0050F2
J1	CONNECTOR, Receptacle, electrical	27823-0014	USC SM1-14M2SL-DM30
Q1	TRANSISTOR, Type 2N647	22442	
Q2	TRANSISTOR, Type 2N1184	8984-0004	
R1	RESISTOR, Fixed, comp, 33,000 ohms ± 10 per cent, 1/4 w	200-0333	AB CB3331
R2	RESISTOR, Fixed, same as R1		
R3	RESISTOR, Fixed, same as R1		
R4	RESISTOR, Fixed, same as R1		
R5	RESISTOR, Fixed, same as R1		
R6	RESISTOR, Fixed, same as R1		
R7	RESISTOR, Fixed, same as R1		
R8	RESISTOR, Fixed, same as R1		
R9	RESISTOR, Fixed, same as R1		
R10	RESISTOR, Fixed, same as R1		
R11	RESISTOR, Fixed, comp, 1500 ohms ± 5 per cent, 1/2 w	201-0152	AB EB1525
R12	RESISTOR, Fixed, comp, 1200 ohms ± 5 per cent, 1/2 w	201-0122	AB EB1225
R13	RESISTOR, Fixed, comp, 470 ohms ± 5 per cent, 1/2 w	201-0471	AB EB4715
R14	RESISTOR, Fixed, comp, 33 ohms ± 5 per cent, 1/2 w	201-0330	AB EB3305
R15	RESISTOR, Fixed, comp, 220 ohms ± 5 per cent, 1/2 w	201-0221	AB EB2215
R16	RESISTOR, Fixed, comp, 10 ohms ± 5 per cent, 1/2 w	201-0100	AB EB1005
R17	RESISTOR, Fixed, comp, 22 ohms ± 5 per cent, 1/2 w	201-0220	AB EB2205
R18	RESISTOR, Fixed, ww, 300 ohms ± 3 per cent, 3 w	209-0301	DABU RS2-301H
R19	RESISTOR, Variable, comp, 1000 ohms ± 20 per cent, 1/2 w	8915-0102	AB GLU1022SD3028L
T1	TRANSFORMER, Audio output	18558	CMPB L-1872A



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Figure 2. F-19B Isolation Amplifier,
Typical Interconnection Diagram

TABLE III. REPLACEABLE PARTS

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
C1	CAPACITOR, Fixed, electrolytic, 6.8 μ f $\pm$ 20 per cent, 35 vdcw	21485-9681	SPR 150D685X0035B2
C2	CAPACITOR, Fixed, electrolytic, 47 μ f $\pm$ 20 per cent, 20 vdcw	8914-0470	SPR 150D476X0020R2
C3	CAPACITOR, Fixed, electrolytic, 60 μ f $\pm$ 20 per cent, 6 vdcw	8918-0600	SPR 150D606X0006B2
C4	CAPACITOR, Fixed, same as C2		
C5	CAPACITOR, Fixed, electrolytic, 47 μ f $\pm$ 20 per cent, 50 vdcw	8924-0470	SPR 109D476X0050F2
J1	CONNECTOR, Receptacle, electrical	27823-0014	USC SM1-14M2SL-DM30
Q1	TRANSISTOR, Type 2N647	22442	
Q2	TRANSISTOR, Type 2N1184	8984-0004	
R1	RESISTOR, Fixed, comp, 33,000 ohms $\pm$ 10 per cent, 1/4 w	200-0333	AB CB3331
R2	RESISTOR, Fixed, same as R1		
R3	RESISTOR, Fixed, same as R1		
R4	RESISTOR, Fixed, same as R1		
R5	RESISTOR, Fixed, same as R1		
R6	RESISTOR, Fixed, same as R1		
R7	RESISTOR, Fixed, same as R1		
R8	RESISTOR, Fixed, same as R1		
R9	RESISTOR, Fixed, same as R1		
R10	RESISTOR, Fixed, same as R1		
R11	RESISTOR, Fixed, comp, 1500 ohms $\pm$ 5 per cent, 1/2 w	201-0152	AB EB1525
R12	RESISTOR, Fixed, comp, 1200 ohms $\pm$ 5 per cent, 1/2 w	201-0122	AB EB1225
R13	RESISTOR, Fixed, comp, 470 ohms $\pm$ 5 per cent, 1/2 w	201-0471	AB EB4715
R14	RESISTOR, Fixed, comp, 33 ohms $\pm$ 5 per cent, 1/2 w	201-0330	AB EB3305
R15	RESISTOR, Fixed, comp, 220 ohms $\pm$ 5 per cent, 1/2 w	201-0221	AB EB2215
R16	RESISTOR, Fixed, comp, 10 ohms $\pm$ 5 per cent, 1/2 w	201-0100	AB EB1005
R17	RESISTOR, Fixed, comp, 22 ohms $\pm$ 5 per cent, 1/2 w	201-0220	AB EB2205
R18	RESISTOR, Fixed, ww, 300 ohms $\pm$ 3 per cent, 3 w	209-0301	DABU RS2-301H
R19	RESISTOR, Variable, comp, 1000 ohms $\pm$ 20 per cent, 1/2 w	8915-0102	AB GLU1022SD3028L
T1	TRANSFORMER, Audio output	18558	CMPB L-1872A

NOTES:

1. SPEAKER CONNECTIONS SHOWN ARE FOR 8-OHM SPEAKERS. REFER TO ARC TYPE F-16A INSTRUCTION BOOK FOR OTHER SPEAKER CONNECTIONS.
2. USE LOW-IMPEDANCE (600-OHM) HEADSETS ONLY.
3. USE CARBON PRESS-TO-TALK MICROPHONES ONLY.
4. IF THE PILOT DESIRES TO MONITOR THE CO-PILOT'S SIDETONE CIRCUIT, OR THE COPILOT THE PILOT'S SIDETONE CIRCUIT, CONNECT SIDETONE LEADS TO F-19B INPUT LEAD AS SHOWN BY THE DOTTED LINES.
5. WIRES MARKED WITH ASTERISK (*) ARE NO. 18 AWG STRANDED COPPER, TEFLON INSULATED.
6. UNMARKED WIRES ARE NO. 24 AWG STRANDED COPPER, TEFLON INSULATED.
7. SHIELDED WIRES ARE NO. 22 AWG WITH BRAIDED COPPER SHIELD.

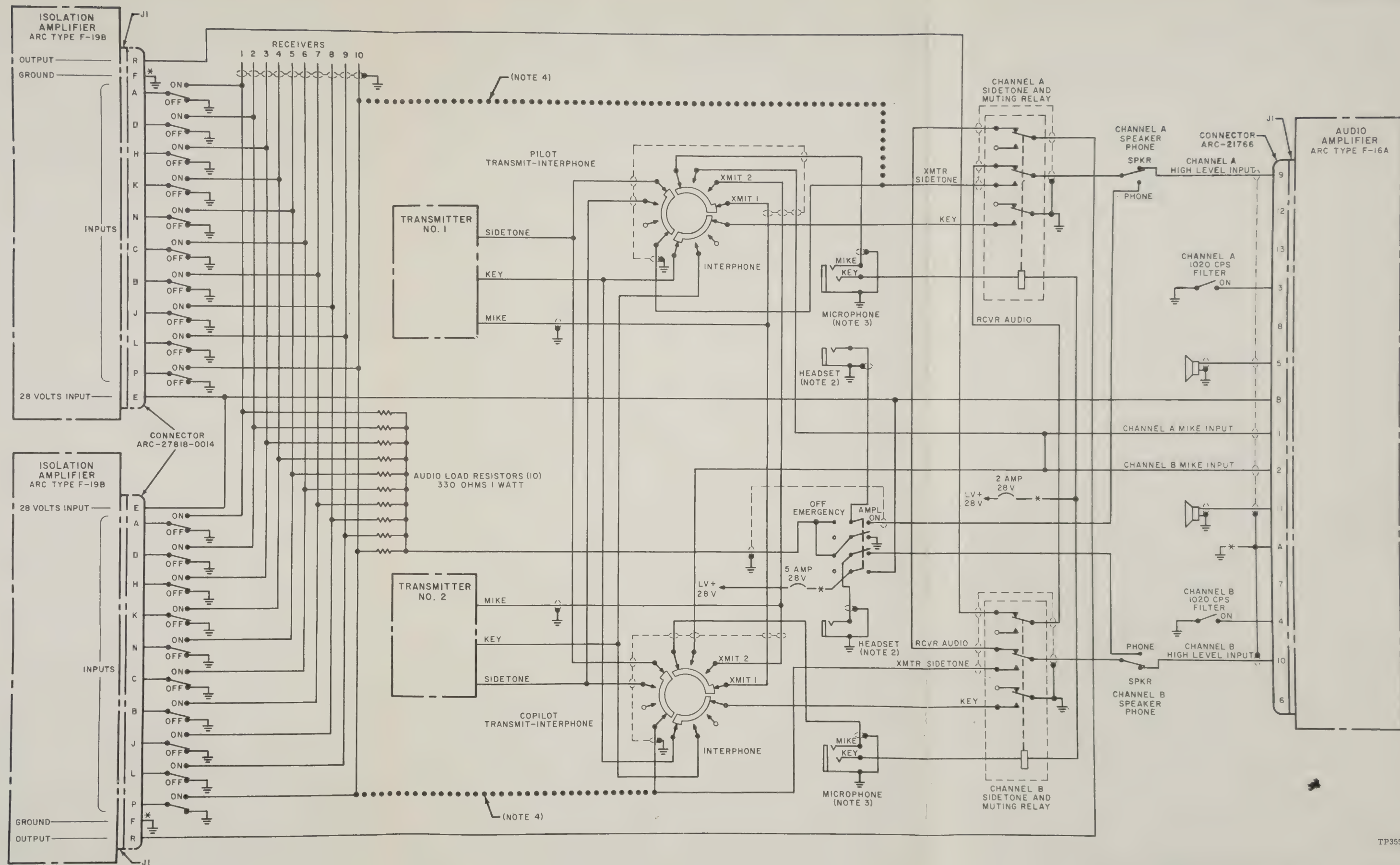


Figure 2. F-19B Isolation Amplifier, Typical Interconnection Diagram

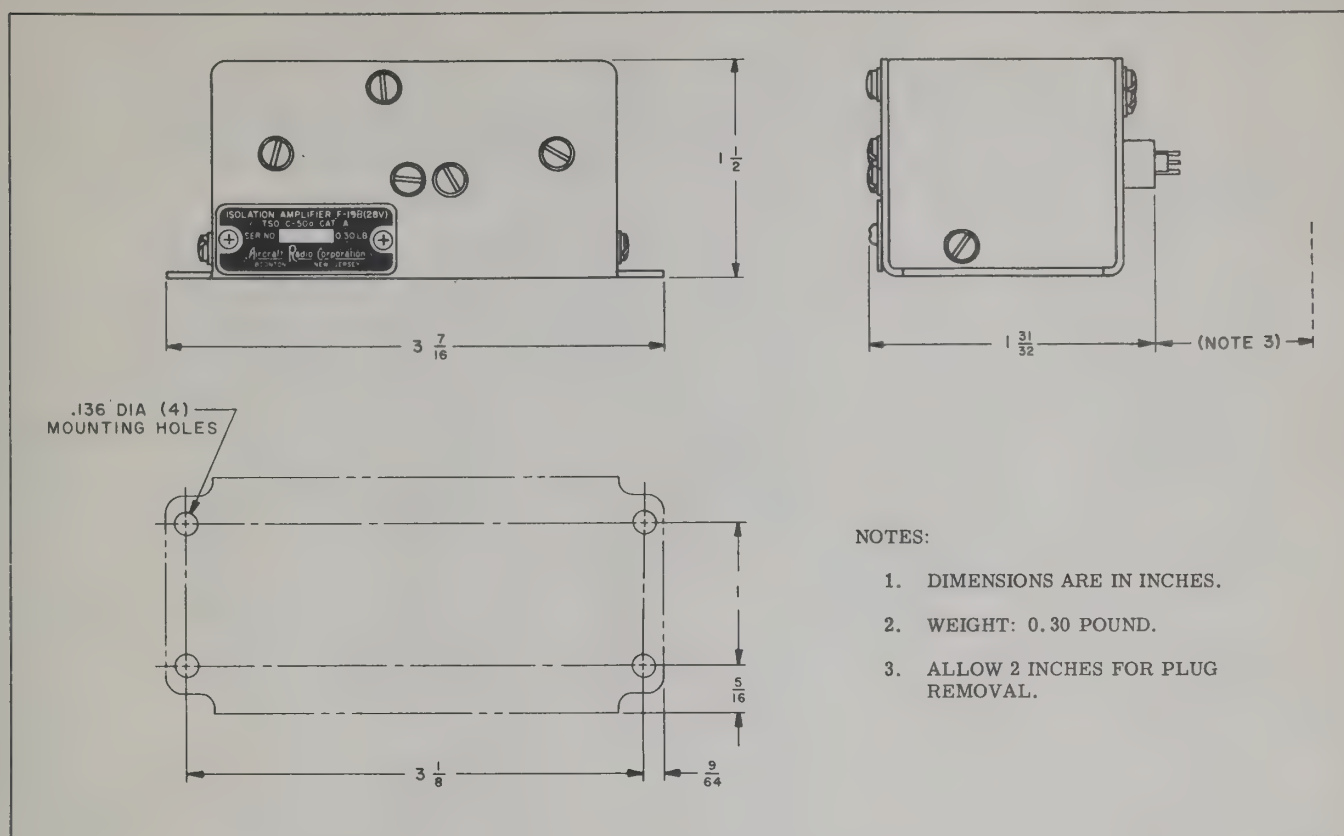


Figure 3. F-19B Isolation Amplifier, Installation Dimensions

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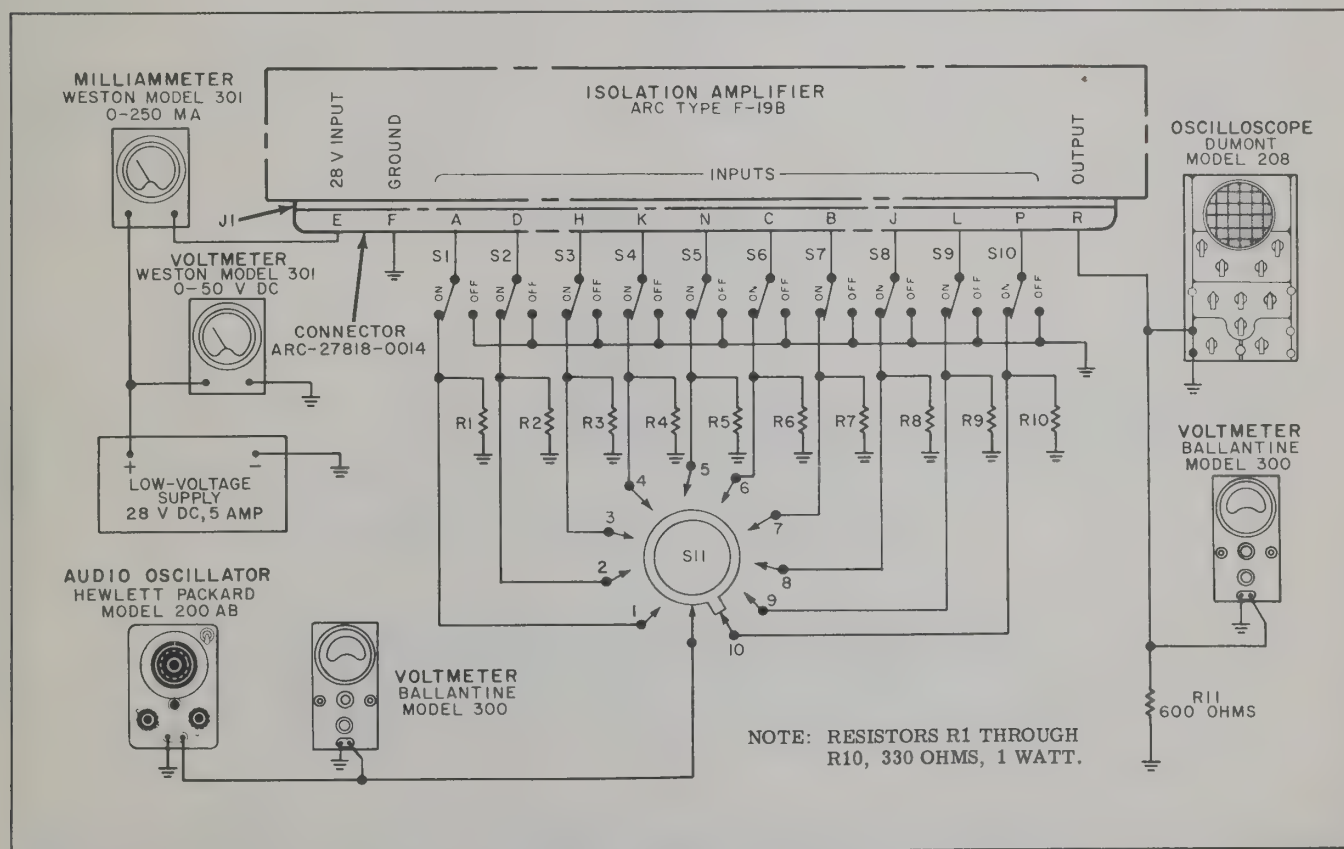
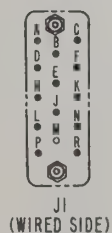
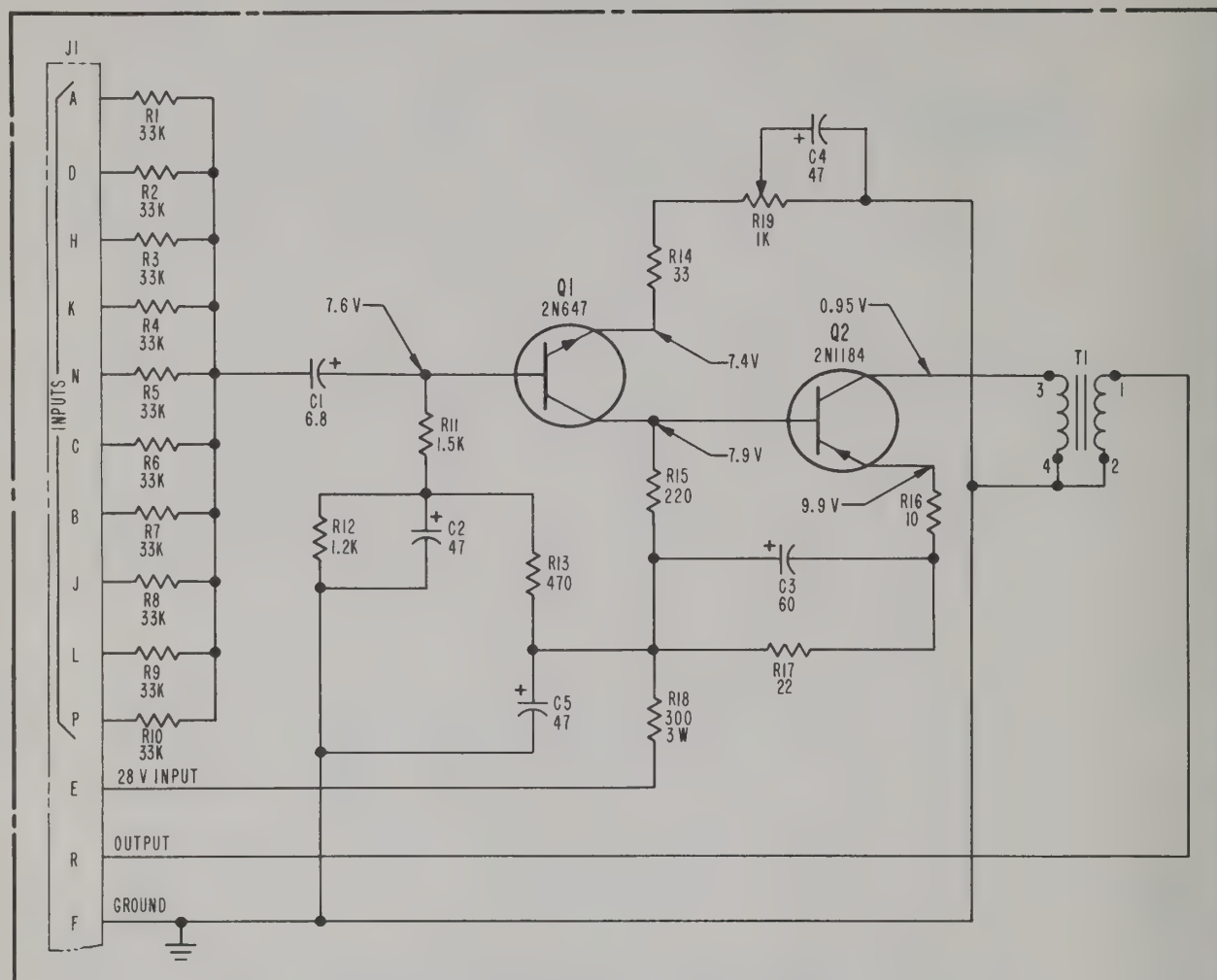


Figure 4. F-19B Isolation Amplifier, Bench Test Interconnection Diagram

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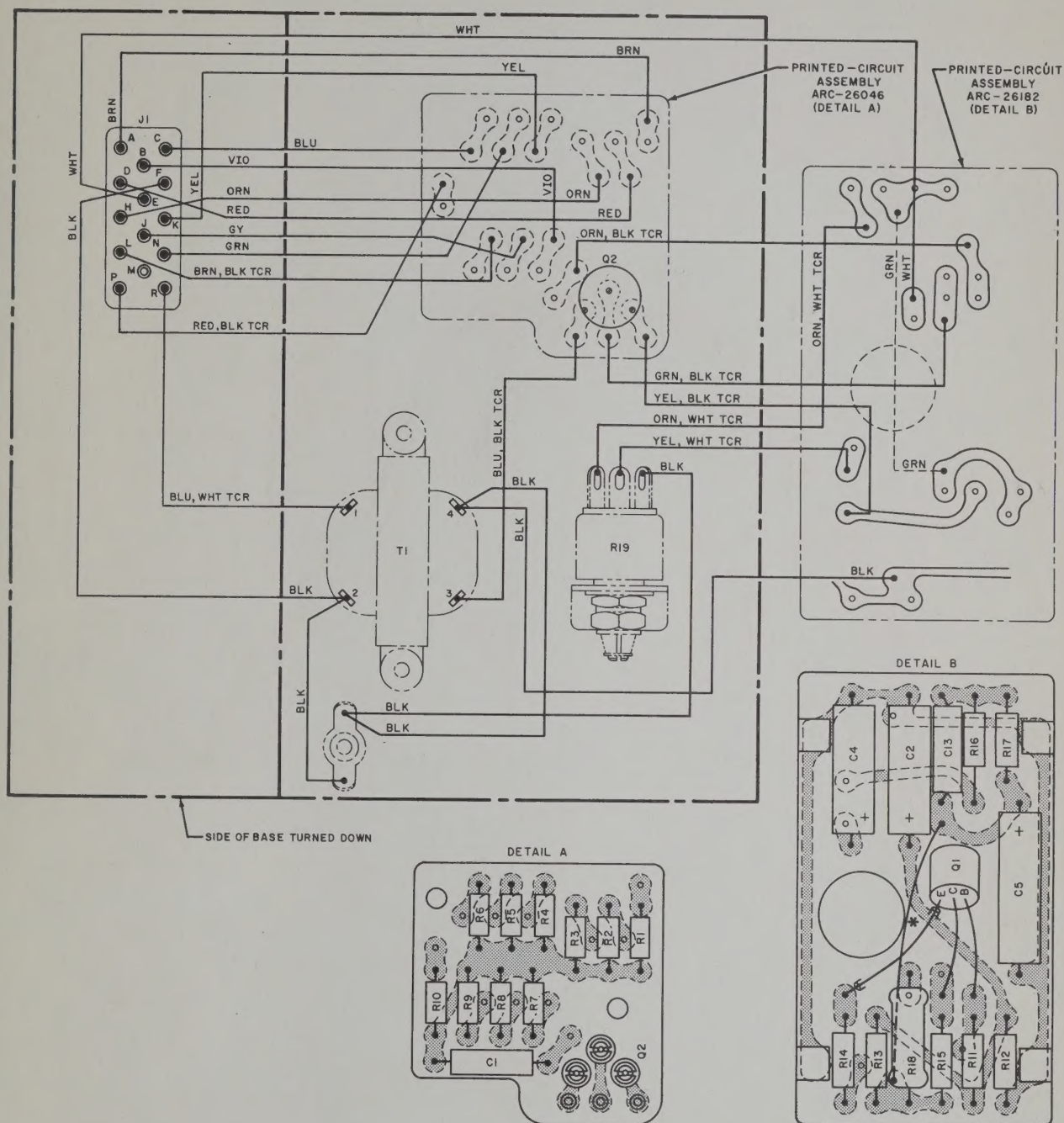


NOTES:

1. FOR WIRING DIAGRAM, SEE FIGURE 6.
2. RESISTANCE VALUES ARE IN OHMS; MULTIPLIER K = 1000.
3. CAPACITANCE VALUES ARE IN MICROFARADS (μ F).
4. VOLTAGES ARE APPROXIMATE D-C VALUES AND ARE BASED ON THE FOLLOWING CONDITIONS:
 - A. MEASUREMENTS ARE MADE WITH RESPECT TO GROUND USING A HEWLETT-PACKARD MODEL 410B VACUUM TUBE VOLTMETER.
 - B. LV+ IS SET TO 27.5 VOLTS.
 - C. R19 IS SET FULLY CLOCKWISE.
 - D. F-19B OUTPUT IS APPLIED TO A 600-OHM LOAD.
 - E. A 1000-CPS AUDIO INPUT SIGNAL WITH SUFFICIENT AMPLITUDE TO PRODUCE A 7.75-VOLT F-19B OUTPUT IS APPLIED TO AN F-19B "INPUT" TERMINAL.

Figure 5. F-19B Isolation Amplifier, Schematic Diagram

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NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5.
2. WIRES MARKED WITH COLOR NOTE ARE NO. 24 STRANDED COPPER, TEFLON INSULATED.
3. WIRE MARKED WITH ASTERISK (*) IS NO. 24 SOLID COPPER, TEFLON INSULATED.
4. 0.032-INCH TEFLON TUBING IS INSTALLED OVER WIRE MARKED .
5. SHADED AREAS DENOTE UNETCHED COPPER ON OPPOSITE SIDES OF PRINTED-CIRCUIT BOARDS.

Figure 6. F-19B Isolation Amplifier, Wiring Diagram



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